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(54) ELECTRICAL EQUIPMENT CASE

(71) We, INTERNATIONAL STANDARD ELECTRIC CORPORATION, a Corporation organised and existing under the Laws of the State of Delaware, United States of America, of 320 Park Avenue, New York 22, State of New York, United States of America, do hereby declare the invention for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:

The present invention relates to a case containing electrical equipment and it will be described, by way of example, with reference to a case for remote control equipment for radio and television sets.

However, its use is not limited to this application and a case in accordance with the present invention may be used, for example, to house the battery operated remote control signal transmitters for model aeroplanes and ships, toys, or garage doors. In colour television sets it is possible to control remotely, for example, the selection of a channel, by switching to different television channels of different bands, the volume, the brightness, the contrast, the colour saturation, and the tint.

Conventional control-signal transmitters, however, have switches, push-buttons, or contacts, which must be operated mechanically.

According to the present invention there is provided a case containing electrical equipment having a switch with switch electrodes which are not mechanically movable relative to one another, the arrangement of the electrodes and the case being such that at least one of the electrodes can be touched by an operator to operate the switch when the case is closed, and wherein the switch has two electrodes arranged concentrically, one of the said electrodes being a cylindrical pin.

The central electrode can be a pin inserted

in a hole in a printed circuit board, to which it is secured with a spring lock washer. The central electrode is in contact with circuit conductors, via connections on the printed circuit board.

In a further embodiment of the invention depressions or ribs are provided separating the electrodes of one switch from those of another. Appropriately, the front end of the case is provided with a grille which allows ultrasonic waves to pass, while at the opposite end there is provided an opening with a lid which can be closed and through which a battery can be introduced.

Embodiments of the invention will now be described with reference to the accompanying drawings in which:—

Figure 1 is a perspective view of a control-signal transmitter;

Figure 2a is a plan view of the electrodes of a switch of Figure 1;

Figure 2b is a section through a switch and printed circuit board;

Figure 3 is a perspective view of a further control-signal transmitter.

Referring to the drawings there is shown a conducting case 1 which can be made in whole or in part of metal or a conducting plastics material. Alternatively it can be made of an insulating plastics material, if the switch electrodes are as shown in Figure 2b.

A front grille 2 at one end of the case passes the ultrasonic waves of an electro-acoustic transducer 3 which are radiated forward as soon as one of a number of switches 6 to 13 is touched with a finger. A battery 4 is located, for example, in the back portion of the case at the opposite end from the grille and is accessible and replaceable through a hinged or removable lid 5. For controlling a colour television receiver, the finger-touch switches 6 to 13 have been assigned the following control functions:—

6=channel selection

- 7=volume up
- 8=volume down
- 9=brightness up
- 10=brightness down
- 11=colour up
- 12=colour down
- 13=receiver on/off.

The arrangement of an electrode and counter electrode of a switch of Figure 1 is shown in Figure 2a. The electrodes comprise an inner electrode designated 14, and an outer electrode 16 which can be the case where the case is of an electrically conducting material or a metal plate in the situation in which the outer electrode is common to all of the switches. An insulating interspace 15 between both electrodes can be of insulating material or air. An operating finger establishes the contact between the inner electrode 14 and the outer counter electrode 16, thereby bridging the insulating interspace. The contact can be resistive, capacitive, or a combination of the two.

A particularly practical embodiment is shown in Figure 2b, in which a cylindrical inner electrode 14 has been inserted as a pin in a hole in a printed circuit board 19. The electrode pin 14 is secured by means of a spring lock or safety washer 17. The copper-clad upper side of the printed circuit board 19 enables contact to be made with conductors 20. The Figure shows a transistor 21 mounted on the printed circuit board 19. A counter electrode 16, which is made as a metal sleeve and is also connected in the circuit via conductors 20, can be omitted, as indicated in Figure 2a where the counter electrode 16 is the case, if the case surface or case wall 18 itself is conductive and suitably connected. The insulating interspace 15 is filled by a sleeve of plastics material, which is centred on the electrode pin 14 with respect to the surrounding elements 16 and 18. If air insulation is required, the sleeve of insulating material can be dispensed with.

In Figure 3 there is shown a control-signal transmitter having a case 1 with a ribbed surface 24, which avoids any wrong operation of the electrodes due to the finger of an operator touching the electrodes of two or more switches simultaneously. This surface 24 has the added advantage that the position of the electrodes can be better felt without the electrodes having to be seen. To enable an even better distinction to be made between the various switch electrodes, different, visible and/or tactile markings may be provided near the touching points.

The finger-touch electrodes and/or the shielding case may also be made entirely or partially of chromium-plated metal and/or conducting plastics material (except, of course, for necessary insulation between the electrodes of each switch).

It is also advantageous if the paths via the

insulating material or the air path between an electrode and its counter electrode are made so that any bridging touch by insects is rendered impossible or difficult.

A case made of a conducting plastics material forms a shield for the control-signal transmitter.

Although particular embodiments have been described by way of example, it will be appreciated that variations and modifications, including combinations of features, can be made within the scope of the claims.

It will be appreciated that, in the case of the capacitive bridging of the electrodes of a switch, it is sufficient simply to touch one of the electrodes physically with a finger, the connection being completed by the capacitive coupling which exists between the operator and the other electrode.

WHAT WE CLAIM IS:—

1. A case containing electrical equipment having a switch with switch electrodes which are not mechanically movable relative to one another, the arrangement of the electrodes and the case being such that at least one of the electrodes can be touched by an operator to operate the switch when the case is closed, and wherein the switch has two electrodes arranged concentrically, one of the said electrodes being a cylindrical pin.

2. A case containing electrical equipment according to claim 1, in which the cylindrical pin electrode is mounted on a printed circuit board.

3. A case containing electrical equipment according to claim 2 in which the pin is secured to the board with a spring lock washer and is in contact with the conductors of the printed circuit board on the side of the board opposite to the spring lock washer.

4. A case containing electrical equipment according to any one of the preceding claims in which the space between the central pin electrode and the outer concentric electrode contains electrically insulating material.

5. A case containing electrical equipment according to any preceding claim, in which the case acts as the outer concentric electrode.

6. A case containing electrical equipment according to any one of the preceding claims and comprising a plurality of said switches, and in which depressions are provided in or ribs are provided on the case surface between the switch electrode positions.

7. A case containing electrical equipment according to any one of the preceding claims in which tactile markings are provided on the surface of the case near the switch electrode positions in order to enable the positions to be identified.

8. A case containing electrical equipment according to any one of the preceding claims, in which the electrodes and/or the

case are entirely or partially made of chromum-plated metal and/or of conducting plastics material, apart from any high value insulating material necessary between the electrodes of the, or each, switch.

9. A case containing electrical equipment according to any one of the preceding claims, the case having a grille at one end through which ultrasonic waves can pass.

10. A case containing electrical equipment according to claim 9 having a hinged or removable lid whereby a battery can be introduced into the case.

11. A case containing electrical equip-

ment as claimed in any preceding claim, wherein said equipment includes a remote control signal transmitter for the operation remotely of radio and television receivers.

12. A case containing electrical equipment substantially as described herein with reference to the accompanying drawings.

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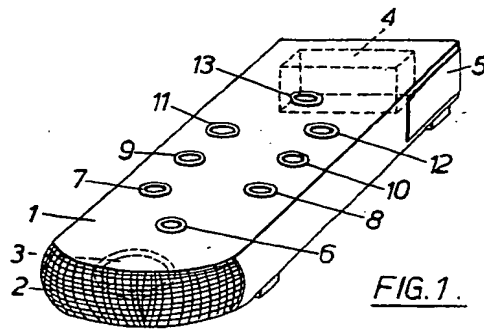


FIG. 1.

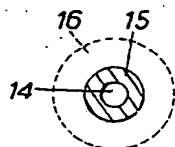


FIG. 2a.

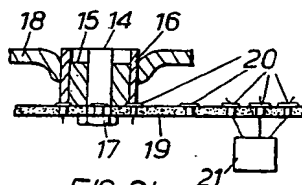


FIG. 2b.

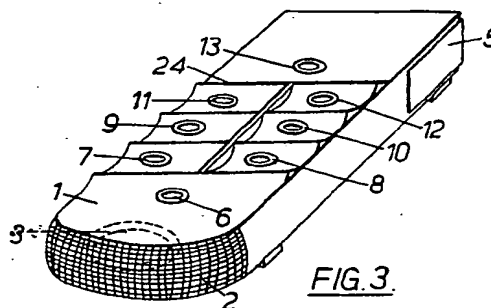


FIG. 3.